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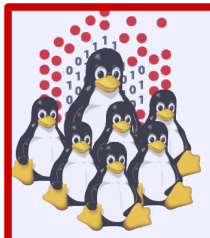
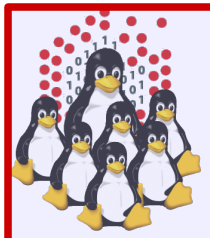
Installation Procedures for Clusters

PART 4 – Hands-on Laboratory



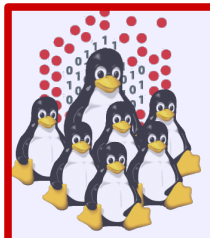
Agenda

- Cluster Services
- Overview on Installation Procedures
- Configuration and Setup of a NETBOOT Environment
- Troubleshooting
- Cluster Management Tools
- Notes on Security
- Hands-on Laboratory Session



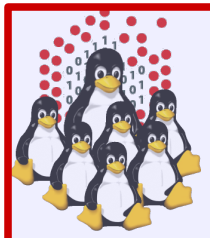
Hands-on Laboratory – Session 1

- Installation of a master node
- Post configuration of the master node
- Setting up NETBOOT services (DHCP, TFTP, PXE, NFS, package repository)
- Installing our first computing node
- Testing the cluster environment



Hands-on Laboratory – Session 2

- Passwordless environment and *c3* tools
- NFS shares
- Installing and configuring the resource management system (*torque*+*maui*)
- Serial job submission
- *OpenMPI* and parallel job submission
- Compilers and *module*s (optional)

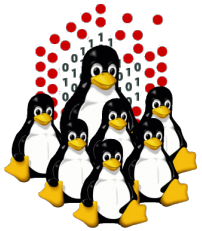


Hands-on Laboratory – Session 3

- Monitoring tools (*ganglia*) (*)
- Configuring DNS (*bind*) (*)
- kickstart `%post`: further configuration (*)
- NAT setup and IP forwarding (*iptables*) (*)

(*) optional


Hands-on Laboratory Session
Let's do it!
http://edu.escience-lab.org
http://elearn.escience-lab.org



REFERENCES AND USEFUL LINKS

Cluster Toolkits:

- OSCAR – Open Source Cluster Application Resources
  http://oscar.openclustergroup.org/
- NPACI Rocks
  http://www.rocksclusters.org/
- Scyld Beowulf
  http://www.beowulf.org/
- CSM – IBM Cluster Systems Management
  http://www.ibm.com/servers/eserver/clusters/software/
- xCAT – eXtreme Cluster Administration Toolkit
  http://www.xcat.org/
- Warewulf/PERCEUS
  http://www.warewulf-cluster.org/ http://www.perceus.org/

Installation Software:

- SystemImager http://www.systemimager.org/
- FAI http://www.informatik.uni-koeln.de/fai/
- Anaconda/Kickstart http://fedoraproject.org/wiki/Anaconda/Kickstart

Management Tools:

- openssh/openssl
  http://www.openssh.com
  http://www.openssl.org
- C3 tools – The Cluster Command and Control tool suite
  http://www.csm.ornl.gov/torc/C3/
- PDSH – Parallel Distributed SHell
  https://computing.llnl.gov/linux/pdsh.html
- DSH – Distributed SHell
  http://www.netfort.gr.jp/~dancer/software/dsh.html.en
- ClusterSSH
  http://clusterssh.sourceforge.net/
- C4 tools – Cluster Command & Control Console
  http://gforge.escience-lab.org/projects/c-4/

Monitoring Tools:

- Ganglia http://ganglia.sourceforge.net/
- Nagios http://www.nagios.org/
- Zabbix http://www.zabbix.org/

Network traffic analyzer:

- tcpdump http://www.tcpdump.org
- wireshark http://www.wireshark.org

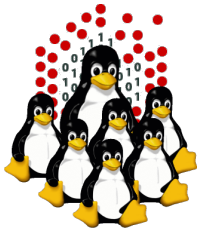
UnionFS:

- Hopeless, a system for building disk-less clusters
  http://www.evolware.org/chri/hopeless.html
- UnionFS – A Stackable Unification File System
  http://www.unionfs.org
  http://www.fsl.cs.sunysb.edu/project-unionfs.html

RFC: (http://www.rfc.net)

- RFC 1350 – The TFTP Protocol (Revision 2)
  http://www.rfc.net/rfc1350.html
- RFC 2131 – Dynamic Host Configuration Protocol
  http://www.rfc.net/rfc2131.html
- RFC 2132 – DHCP Options and BOOTP Vendor Extensions
  http://www.rfc.net/rfc2132.html
- RFC 4578 – DHCP PXE Options
  http://www.rfc.net/rfc4578.html
- RFC 4390 – DHCP over Infiniband
  http://www.rfc.net/rfc4390.html

- PXE specification
  http://www.pix.net/software/pxeboot/archive/pxespec.pdf
- SYSLINUX http://syslinux.zytor.com/



Some acronyms...

ICTP – the Abdus Salam International Centre for Theoretical Physics
DEMOCRITOS – Democritos Modeling Center for Research In aTOmistic Simulations
INFM – Istituto Nazionale per la Fisica della Materia (Italian National Institute for the Physics of Matter)
CNR – Consiglio Nazionale delle Ricerche (Italian National Research Council)

HPC – High Performance Computing

OS – Operating System
LINUX – LINUX is not UNIX
GNU – GNU is not UNIX
RPM – RPM Package Manager

CLI – Command Line Interface
BASH – Bourne Again SHell
PERL – Practical Extraction and Report Language

PXE – Preboot Execution Environment
INITRD – INITial RamDisk

NFS – Network File System
SSH – Secure SHell
LDAP – Lightweight Directory Access Protocol
NIS – Network Information Service
DNS – Domain Name System

PAM – Pluggable Authentication Modules

LAN – Local Area Network
WAN – Wide Area Network

IP – Internet Protocol
TCP – Transmission Control Protocol
UDP – User Datagram Protocol
DHCP – Dynamic Host Configuration Protocol
TFTP – Trivial File Transfer Protocol
FTP – File Transfer Protocol
HTTP – Hyper Text Transfer Protocol
NTP – Network Time Protocol

NIC – Network Interface Card/Controller
MAC – Media Access Control
OUI – Organizationally Unique Identifier

API – Application Program Interface
UNDI – Universal Network Driver Interface
PROM – Programmable Read-Only Memory
BIOS – Basic Input/Output System

SNMP – Simple Network Management Protocol
MIB – Management Information Base
OID – Object IDentifier

IPMI – Intelligent Platform Management Interface
LOM – Lights-Out Management
RSA – IBM Remote Supervisor Adapter
BMC – Baseboard Management Controller